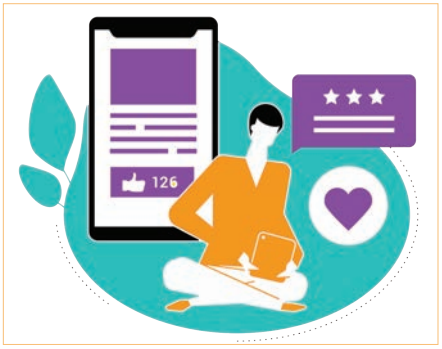

Influence of Social Media on Cosmetic Procedure Interest

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J Clin Aesthet Dermatol. 2020;13(1):28–31

ABSTRACT

BACKGROUND: Social media is increasingly cited as a contributing factor to the rising public interest in cosmetic procedures. By tracking online search interests, Google Trends (GT) can help quantify these trends. **OBJECTIVES:** We used GT (trends.google.com) to explore trends in online interest in cosmetic procedures and compare how effects differed by procedure type and their relation to medical specialty. **METHODS:** Google Trends search term data was collected and compared with annual Instagram and Facebook user counts. Linear regression evaluated search trends over time, and Pearson correlations were used to compare terms. A Benjamini-Hochberg adjustment for multiple comparisons resulted in significance set at $p<0.02$, except for comparisons between specialties, for which $p<0.01$ was significant. **RESULTS:** The terms *dermatologist, Botox, Juvederm, Radiesse, CoolSculpting, Kybella,* and *facelift* are increasing in popularity, whereas the terms *Restylane, liposuction, rhinoplasty* and *breast augmentation* are decreasing in popularity ($p<0.02$). No change was observed for other terms. The terms *dermatologist, Botox, Juvederm, Radiesse, CoolSculpting* and *Kybella* were associated with both Instagram and Facebook users, but *blepharoplasty* and *rhinoplasty* were only associated with Instagram users ($p<0.01$). Searches for *Juvederm* and *facelift* were only associated with the term *dermatologist*, and searches for *Sculptra*, *blepharoplasty*, and *rhinoplasty* were only associated with *plastic surgeon* ($p<0.01$). For all other search terms, significant correlations were seen with both specialties. **CONCLUSION:** Online interest in noninvasive cosmetic procedures is increasing, potentially driven, in part, by social media. Interest in dermatology is also increasing, creating a need for dermatologists to respond to these shifts in market trends.

KEY WORDS: social media, cosmetic dermatology, cosmetic procedures, public interest, Google Trends

Demand for invasive and noninvasive cosmetic procedures in the United States is increasing.[1,2] As physicians trained in providing many of these noninvasive procedures, dermatologists should be aware of trends in public interest regarding these procedures. While the public's increasing interest is likely multifactorial, social media appears to be a new and impressive driving force.[3–8] One study suggested that 95 percent of patients considering a cosmetic procedure had consulted an online source, including social media.[6] Studies evaluating the motives of patients for pursuing cosmetic procedures cite experiences with social media as a key factor.[3,5] As the reach of social media platforms such as Facebook and Instagram continue to expand, the number of people exposed to information regarding these procedures will continue to increase, affecting both absolute demand and the cosmetic patient demographic mix.[4,5,7,9,10]

Information available on social media can vary dramatically, from online educational materials and physician-run accounts to patient experiences and advertisements.[6,7] In addition, promotions from celebrity accounts can also affect public interest. One article found that online search interest for dermal fillers increased substantially after United States (US) celebrity Kylie Jenner announced she had received Juvederm® lip injections.[11]

Awareness of trends in public interest can aid physicians in understanding cosmetic market demands and guiding educational efforts. Knowing which products interest patients can guide physician training, product inventory on hand, and educational materials. Since most patients consult online materials regarding cosmetic procedures, one powerful way to track public interest is using Google Trends® (GT), which tracks interest in a topic over time and by location.

The objective of this study was to determine changes in online interest using GT for common invasive and noninvasive cosmetic procedures in the US. We also sought to determine the correlation between these search terms and average number of users over time for Facebook and Instagram. Finally, GT search data for cosmetic procedures was correlated with GT search data for dermatologist or plastic surgeon.

METHODS

GT was queried for US searches from January 2004 to December 2017 for the

FUNDING: No funding was provided for this study.

DISCLOSURES: Dr. Hopkins and Mr. Moreno do not have any conflicts of interest relevant to the content of this article. Dr. Secrest has received esearch grants from the American Skin Association, National Eczema Association, and National Psoriasis Foundation.

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terms *dermatologist, plastic surgeon, Botox, Juvederm, Radiesse, Restylane, CoolSculpting, Sculptra, Kybella, facelift, liposuction, rhinoplasty, blepharoplasty,* and *breast augmentation*. We selected the four most popular invasive (breast augmentation, liposuction, rhinoplasty, and blepharoplasty) and the two most popular noninvasive (Botox and dermal fillers) procedures performed in the US, as reported by the American Society of Plastic Surgeons.[4] We separated the dermal fillers group into specific brands because brand names are vastly more popular search terms than the general term *dermal fillers;* we also wished to better understand the popularity of different dermal fillers. The search term *microabrasion* was not evaluated because it was far less popular than other search terms. *Chemical peel* and *laser hair removal* were not evaluated terms as these are commonly performed outside of a physician's office. We also considered alternate terms, such as generic or colloquial names for procedures (e.g., *nose job* instead of *rhinoplasty*); however, surprisingly, medical terms and brand names were more commonly searched.

As a surrogate measure for social media usage, aggregate total annual Facebook and Instagram users were retrieved for all available years: 2008 to 2017 and 2010 to 2017 respectively.[12,13]

Univariable linear regression was used evaluate trends and popularity in GT search terms over time. A positive correlation (i.e., increasing overall search volume over time) represents an increase in popularity. Aggregate user counts from Facebook/Instagram were compared to search terms over time using Pearson correlation to explore the relationship between search term interest and the growth of social media usage. Additionally, GT search terms for cosmetic procedures were compared to searches for *dermatologist* and *plastic surgeon* using Pearson correlation to determine which specialty was more associated with searches for each procedure. Benjamini-Hochberg adjustment with an α=0.05 was used for multiple comparisons, and $p<0.02$ was considered significant. However, for comparisons between specialties (dermatology vs. plastic surgery), $p<0.01$ was significant. Statistical analysis was performed in STATA v.14.2.

RESULTS

Searches for *dermatologist, Botox, Juvederm, Radiesse CoolSculpting, Kybella*, and *facelift* are increasing in popularity over time, whereas searches for *Restylane, liposuction, rhinoplasty,* and *breast augmentation* are decreasing in popularity. No significant trend was observed for *plastic surgeon, Radiesse, Sculptra*, or *blepharoplasty* (Table 1).

Increasing popularity of the search terms *dermatologist, Botox, Juvederm, Radiesse, CoolSculpting* and *Kybella* was associated with numbers of both Instagram and Facebook users (Table 2). The terms *blepharoplasty* and *rhinoplasty* were associated with numbers of Instagram users only (r=0.69, p=0.004 and r=0.66, p=0.01, respectively).

Searches for both *dermatologist* and *plastic surgeon* were correlated with search terms *Botox, Restylane, CoolSculpting, Kybella, liposuction,* and *breast augmentation* (Table 3). Searches using the terms *Juvederm* and *facelift* were only associated with the search term *dermatologist*, while *Sculptra, rhinoplasty,* and *blepharoplasty* search terms were only associated with *plastic surgeon* ($p\leq0.01$).

TABLE 1. Associations with search term popularity over time*

GOOGLE TRENDS SEARCH TERMS	REGRESSION COEFFICIENT OF TERMS OVER TIME (p-VALUE)
Dermatologist	0.40 (<0.001)
Plastic Surgeon	-0.002 (0.88)
Botox	0.17 (<0.001)
Juvederm	0.54 (<0.001)
Radiesse	0.08 (0.02)
Restylane	-0.27 (<0.001)
Sculptra	-0.01 (0.80)
CoolSculpting	0.30 (<0.001)
Kybella	0.28 (<0.001)
Liposuction	-0.15 (<0.001)
Breast augmentation	-0.25 (<0.001)
Blepharoplasty	0.0003 (0.98)
Facelift	0.14 (<0.001)
Rhinoplasty	-0.04 (0.02)

*Positive regression coefficients equate to increased popularity over time; negative regression coefficients to decreased popularity over time

DISCUSSION

Our data demonstrate increasing online public interest in noninvasive cosmetic procedures like Botox, dermal fillers, and body contouring, and decreasing online interest in more invasive procedures like breast augmentation, rhinoplasty, and liposuction, which are similar to that of prior work.[14] Given that so many patients consult online sources for information prior to undergoing cosmetic procedures, these data help in understanding market trends and patient demand.[6] Overall, these data suggest increasing interest in minimally invasive procedures, potentially owing to media attention, decreased cost, and perceived safety.

Understanding market trends has important implications for physician training and choice of product inventory. One 2013 study suggested that the biggest factors contributing to cosmetic product usage among dermatologists was familiarity with each product and training received in residency on each product.[15] This study found that Radiesse® was more popular among physicians than Sculptra.® However, GT data showed that while Radiesse was initially more popular in searches, more recently, Sculptra has become more popular in online searches. These trends in public interest should help guide training on cosmetic products and procedures. Furthermore, since physicians commonly practice independently in different geographic areas from where they train, GT's local search data can help inform physicians of local product/procedure interest. Physicians can use GT to track cosmetic product interest in their area and tailor their training and inventory to help maximize this interest and provide in-demand products.

Market trends can also improve patient education. For example, we found the search term *Juvederm* to be the most popular term by a significant margin for dermal filler searches; this indicates the possibility that patients had heard more about Juvederm and were less aware of other fillers for which they might be better candidates. Likewise, as new fillers emerge with certain characteristics, understanding the online popularity may help guide in-office educational materials.

The positive association of many search terms with number of active user accounts on Instagram and Facebook suggests that social media is influencing online interest in these products and procedures, which is supported by multiple survey-based studies.[5–8] Social media could not only change public interest levels,

TABLE 2. Correlations between search terms and Instagram and Facebook users over time.

GOOGLE TRENDS SEARCH TERMS	CORRELATION COEFFICIENT (*p*-VALUE) WITH INSTAGRAM USERS	CORRELATION COEFFICIENT (*p*-VALUE) WITH FACEBOOK USERS
Dermatologist	**0.58 (0.02)***	**0.54 (0.001)**
Plastic Surgeon	0.22 (0.42)	0.19 (0.26)
Botox	**0.80 (<0.001)**	**0.47 (0.004)**
Juvederm	**0.69 (0.003)**	**0.46 (0.005)**
Radiesse	**-0.89 (<0.001)**	**-0.40 (0.01)**
Restylane	0.19 (0.48)	-0.25 (0.14)
Sculptra	-0.04 (0.89)	0.04 (0.82)
Cool Sculpting	**0.81 (<0.001)**	**0.44 (0.01)**
Kybella	**0.89 (<0.001)**	**0.43 (0.01)**
Liposuction	-0.06 (0.82)	0.09 (0.62)
Breast augmentation	-0.47 (0.07)	-0.10 (0.57)
Blepharoplasty	**0.69 (0.004)**	0.37 (0.03)
Facelift	-0.35 (0.19)	0.17 (0.32)
Rhinoplasty	**0.66 (0.01)**	0.30 (0.08)

*Significance corrections with Benjamini-Hochberg procedure: $p \leq 0.02$ is considered significant (bolded)

TABLE 3. Correlations between search terms and searches for dermatologist and plastic surgeon*

GOOGLE TRENDS SEARCH TERMS	CORRELATION COEFFICIENT (*p*-VALUE) WITH DERMATOLOGIST	CORRELATION COEFFICIENT (*p*-VALUE) WITH PLASTIC SURGEON
Botox	**0.72 (<0.001)†**	**0.26 (0.001)**
Juvederm	**0.89 (<0.001)**	-0.02 (0.78)
Radiesse	**0.21 (0.01)**	**-0.24 (0.002)**
Restylane	**-0.73 (<0.001)**	**0.34 (<0.001)**
Sculptra	0.06 (0.42)	**0.27 (<0.001)**
Cool Sculpting	**0.67 (<0.001)**	**0.42 (<0.001)**
Kybella	**0.58 (<0.001)**	**0.34 (<0.001)**
Liposuction	**-0.43 (<0.001)**	**0.61 (<0.001)**
Breast augmentation	**-0.66 (<0.001)**	**0.41 (<0.001)**
Blepharoplasty	0.02 (0.75)	**0.48 (<0.001)**
Facelift	**0.59 (<0.001)**	**0.20 (0.01)**
Rhinoplasty	-0.12 (0.12)	**0.66 (<0.001)**

*Correlation of searches between dermatologist and plastic surgeon, $r=0.14$, $p=0.06$.
†Significance corrections with Benjamini-Hochberg procedure: $p \leq 0.01$ is considered significant (bolded)

but could also change the demographics of patients seeking these procedures. Instagram tends to have younger users who are female, and might drive female patients into cosmetic clinics seeking these procedures at a younger age.[16,17] Also, physicians might find that having a social media presence that provides accurate educational information regarding these procedures will increase business for their practices. Additionally, dermatologic and cosmetic academies and societies should also consider using social media platforms (Twitter, Instagram, Facebook, etc.) to provide educational materials and a list of board-certified physicians to patients. For dermatologists, having personal or group-based Instagram, Facebook, Twitter, or other social media accounts provides a platform for educational materials, demonstrations, and discussions of treatment options. Additionally, links to practice websites have become essential in today's connected age.

Searches related to dermatology are increasing, but not to plastic surgery, which might be due to increased interest in noninvasive cosmetic procedures. As patients become more interested in dermatology, we need to be prepared to meet their increasing online interest with accurate, up-to-date, and ethical educational materials. Patients get much of their healthcare information from online sources , which are of varying quality and accuracy, highlighting the importance of physicians providing high-quality education material online.[9,10,18–20] Evidence suggests that websites providing high-quality educational information are powerful influencers on the decisions and perceptions of patients regarding their health. On Facebook, research has shown that educational pages hold the attention of active users most, compared to other types of pages the social media platform offers.[21]

Limitations. This study has several limitations. GT data are limited to those with access to the internet; however, the patient population seeking these procedures reports high levels of internet usage.[6] Currently, GT only has data for Google searches and does not provide any data on searcher demographics. Lastly, associations between searches can depend on many factors, making direct comparison difficult. However, these data do support findings from multiple studies that have shown an association between interest in these procedures and social media usage. Thus, despite these limitations, we believe our data offer valuable insight into market trends regarding cosmetic procedures.

CONCLUSION

Dermatologists, with their extensive training, are well-positioned to meet the educational and treatment needs of a growing number of people seeking online information on noninvasive cosmetic procedures. Better understanding of market trends through the use of tools such as GT assists dermatologists with meeting the ever-evolving needs of their patients more effectively and efficiently. Additionally, as part of their practice management, dermatologists should consider using social media as a means to provide the public with accurate and ethical information regarding these procedures.

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